Title of the article

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Graphical Abstract

Abstract

Minimum cost design of a water distribution network (WDN) is desirable as it consumes a major portion of total outlay of any water supply project. Traditionally, a simulation-based trial and error approach have been used, in which pipe sizes are selected based on the experience and judgement of the designer; and the performance to meet the design criteria are checked. Few designs with satisfactory performances are obtained and the one with the minimum cost is adopted. There always remains an element of doubt for the better available design solution. Later, several optimization techniques are developed for the minimum cost design. These techniques start the search from one of the feasible solutions, move to a better cost solution using some mathematical function, and terminates the search when no further reduction in cost is possible. These methodologies identify several near optimal solutions and the probability of reaching to the global optimal solution is enhanced. However, majority of these algorithms are population based and requires several simulations, making these processes computationally expensive and cumbersome, thereby restricting their applications to design large size WDNs. In the recent past, few simple heuristic techniques that avoids the necessity of experience and judgement of designer have been suggested. These simulation-based algorithms directly or indirectly consider the cost aspects and provide results in comparatively smaller number of simulations as compared to that required by metaheuristic algorithms, which makes them a better choice for their application on their own or in combination with metaheuristic algorithms to design large networks. This chapter aims at describing the simple heuristic techniques and explores the application of marginal cost increase head gain ratio method for the design of large WDNs.

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References

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